

REMARKS

Claim 1 has been amended. Claims 2, 3 and 16 were previously cancelled. Claims 1 and 4-15 remain pending in the application. Reconsideration and allowance of all of the claims are respectfully requested in view of the foregoing amendments and of the following remarks.

No new matter has been added to the application.

In regard to the Rejection of Claims 1, 4, 10 and 11 Under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1, 4, 10 and 11 under 35 USC 103 (a) as being unpatentable over Barton et al. (US 6,503,432) in view of Fukumura et al. (US5,674,556) and Kim et al. (US 6,403,432). The Applicants respectfully disagree.

Amended claim 1 now defines that the “the moving current collector sheet is guided in between the first and third slot die openings and between the second and fourth slot die openings thereby forming a bi-face electrochemical assembly.”

Barton et al. discloses two extruded masses forced into an extrusion die 30 and deposited onto a support 40 at location 50. The extruded masses are deposited onto one side of a support or current collector. There is no mention of the support or the current collector sheet being guided between a first and third slot die openings and between a second and fourth die openings as defined in amended claim 1. Barton et al. (col. 13, lines 18-20) mentions that: “it is also possible to extrude multilayer structures on both sides of a current collector substrate”. However, it is not explained how to accomplish this.

Barton et al. discloses (col. 13, lines 21-27) immediately after introducing the notion of multilayer structures on both sides of a current collector that:

“In a preferred embodiment, multilayer structures are cast such that separator layers are present on the surfaces of both the anode and cathode, opposite the surfaces where these electrodes are laminated to their respective current collectors. In this manner, the separator layers form

interfaces with their respective electrode layers that possess very low interfacial impedance.”

In effect, Barton et al. discloses that a multilayer structure consisting of the anode layer and a separator layer and a multilayer structure consisting of the cathode layer and a separator layer are formed separately onto their respective current collector and thereafter the two multilayer structures are laminated together with their separator layers facing each other thereby disclosing as the preferred embodiment, a monoface assembly.

The Applicants submit that Barton et al. only mentions the possibility of forming a bi-face assembly but provides no clues as to how this can be accomplished. Specifically, Barton et al. does not disclose guiding a central current collector sheet between a first and third slot die opening and between a second and fourth die openings as defined in amended claim 1 and it cannot readily be implied from the disclosure of Barton et al.

With regards to Fukumura et al., the Applicants previously submitted that Fukumura et al. discloses a coating process as opposed to an extrusion process as defined in claim 1 and as such Fukumura et al. and Barton et al. cannot be combined as one describes a coating process which includes the use of solvent to reduce the viscosity of the material which is later removed.

A coating process involves an almost liquid paste which is not subjected to the enormous pressure of an extrusion process and the material exiting the coater contains a substantial amount of solvent which must be removed by evaporation. Furthermore, the material exiting the coater does not hold itself together as it is in liquid form. On the other hand, an extrusion process involves a paste or slurry having high viscosity that contains no solvent or almost no solvent. The paste or slurry is mixed and pushed at very high pressure and is self-supporting and in its final form when exiting the extrusion die.

Furthermore, the Applicants submit that the embodiments shown in Figs. 7A and 7B of Fukumura et al. do not provide for guiding a current collector. The support 1 is shown without back up support as clearly mentioned in Col. 6, lines 6-7. This is only possible with a coating process where the material layer is in liquid form.

Col. 6 lines 6-7:

“Examples of coating apparatus having no backup roll are shown in FIGS. 7A and 7B for reference.”

The dynamics of each process is different and the term “extruding” cannot be broadened to encompass “coating”. Fukumura et al. cannot be used to solve the problems of co-extruding thin sheet of electrode and electrolyte and a person skilled in the art at the time the invention would not look to Fukumura et al. to perfect an extrusion process.

Kim et al. simply discloses a bi-face electrochemical cell assembly and is silent as to a co-extrusion process in which a current collector sheet is guided between a first and third slot die openings and between a second and fourth die openings as defined in amended claim 1. In fact, Kim et al. clearly states (col. 7, lines 66-67) that the electrolyte is formed by coating an electrolyte solution.

Col. 7, lines 66-67:

“Preferably, polymer electrolyte 4 is formed by directly coating the polymer electrolyte solution on cathode 6 or anode 1.”

The polymer electrolyte solution contains between 3 and 10 times as much solvent as there is polymer such that it is viscous when formed into a layer.

Col. 7, lines 23-30

“A polymer mixture and a solvent including electrolytic salts are mixed in a mixing ratio of 1:3-10 at room temperature. Then, thus obtained mixture is firstly heated to about 25-100°C for about 10 minutes to 3 hours and then is heated again to about 100-180°C for about 5 minutes to 1 hour to prepare a homogeneous and viscous polymer electrolyte solution.”

The Applicants therefore submit that it would not have been obvious to a person skilled in the art at the time the invention was made to arrive at the claimed invention. As such, the Examiner is requested to withdraw his rejection of amended claim 1 and claims 4, 10 and 11 depending therefrom.

In regard to the Rejection of Claims 5 and 6 Under 35 U.S.C. § 103(a)

The Examiner has rejected claims 5 and 6 under 35 USC 103 (a) as being unpatentable over Barton et al. (US 6,503,432) in view of Fukumura et al. (US 5,674,556) and Kim et al. (US 6,403,432) as applied to claims 1, 4, 10 and 11, and further in view of Kobayashi et al. (US 6,676,865) or Schock (US 3,544,669). The Applicants respectfully disagree.

Kobayashi et al. discloses a molding process of articles with an adhesive and an elastomer. Schock discloses coating of an adhesive layer followed by a plastic overcoat onto a wooden rod which is completely different from a current collector sheet. In both documents, the processes disclosed do not address the problem of co-extruding electrochemical material onto a sheet.

Therefore, at least one element of claim 1 and claims 5 and 6 depending therefrom, is not taught by Kobayashi et al. and Schock alone or in combination. The Applicants submit that it would not have been obvious to a person skilled in the art at the time the invention was made using the information disclosed in Kobayashi et al. and Schock to arrive at the claimed invention without the hindsight of the present application. As such, the Examiner is requested to withdraw his rejection of claims 5 and 6.

In regard to the Rejection of Claims 7 - 9 Under 35 U.S.C. § 103(a)

The Examiner has rejected claims 7-9 under 35 USC 103 (a) as being unpatentable over over Barton et al. (US 6,503,432) in view of Fukumura et al. (US 5,674,556) and Kim et al. (US 6,403,432) as applied to claims 1, 4, 10 and 11, and further in view of Brouwer et al. (US 4,260,556) and Morris (US 5,316,556). The Applicants respectfully disagree.

Morris discloses subsequent coating steps as opposed to a co-extrusion process and Brouwer et al. discloses subsequent extrusions of annular layer through annular dies as opposed to slot dies as defined in claims 7-9.

Therefore, at least one element of claim 1 and claims 7-9 depending therefrom, is not taught by Brouwer et al. and Morris alone or in combination. The Applicants submit that it would not have been obvious to a person skilled in the art at the time the invention was made

using the information disclosed in Brouwer et al. and Morris to arrive at the claimed invention without the hindsight of the present application. As such, the Examiner is requested to withdraw his rejection of claims 7-9.

In regard to the Rejection of Claims 12-15 Under 35 U.S.C. § 103(a)

The Examiner has rejected claims 12-15 under 35 USC 103 (a) as being unpatentable over over Barton et al. (US 6,503,432) in view of Fukumura et al. (US 5,674,556) and Kim et al. (US 6,403,432) as applied to claims 1, 4, 10 and 11, and further in view of Applicants' admitted prior art. The Applicants respectfully disagree.

The Applicants submit that claims 12-15 are all dependent from amended claim 1, which the Applicants believe is now in condition for allowance. Claims 12-15 are therefore allowable as dependent on an allowable claim.

In view of the above remarks, the Applicants respectfully submit that all of the currently pending claims are allowable and that the entire application is in condition for allowance.

Should the Examiner believe that anything further is desirable to place the application in a better condition for allowance; the Examiner is invited to contact the undersigned at the telephone number listed below.

At the time of filing of the present response, the Office was authorized to charge the fees believed to be necessary to a credit card. In case of any under- or over-payment or should any additional fee be otherwise necessary, the Office is hereby authorized to credit or debit (as the case may be) Deposit Account number 502977.

Respectfully submitted,

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